Catalogue of American Amphibians and Reptiles

Means, D. Bruce. 1999. *Desmognathus auriculatus*.

Desmognathus auriculatus (Holbrook)
Southern Dusky Salamander

Salamandra auriculata Holbrook 1838:47. Type locality, "Riceborough, [Liberty County] in Georgia." Holotype, undesignated. "The specimens from which the ... description was taken came from Riceborough, in Georgia, and were furnished me by my friend Dr. Harden." Syntypes are presumed to be USNM 3901 and USNM 271136–45 (Dunn 1926; Kraig Adler 1993, pers. comm.). Examined by author.

Desmognathus auriculatus: Baird 1849:286. First use of combination.

Cylindrosoma auriculatum: Duméril et al. 1854:81.

Plethodon auriculatum: Hallowell 1858:344.

Desmognathus fusca var. *auriculata*: Cope 1869:116.

Desmognathus fuscus auriculatus: Boulenger 1882:78. Emendation.

Desmognathus auruculata: Lönnberg 1894:337. Emendation.

Desmognathus fusca: Beyer 1900:35. Synonymized with *D. fuscus* (Green).

Desmognathus fuscus brimleyorum: Dunn 1926:102 (part).

Desmognathus fuscus carri: Neill 1951: 25. Type locality, "Silver Glen Springs, in the Ocala National Forest, Marion County, Florida." No holotype designated. *Desmognathus f. carri* was synonymized with *D. auriculatus* by Rossman (1959) and Means (1974).

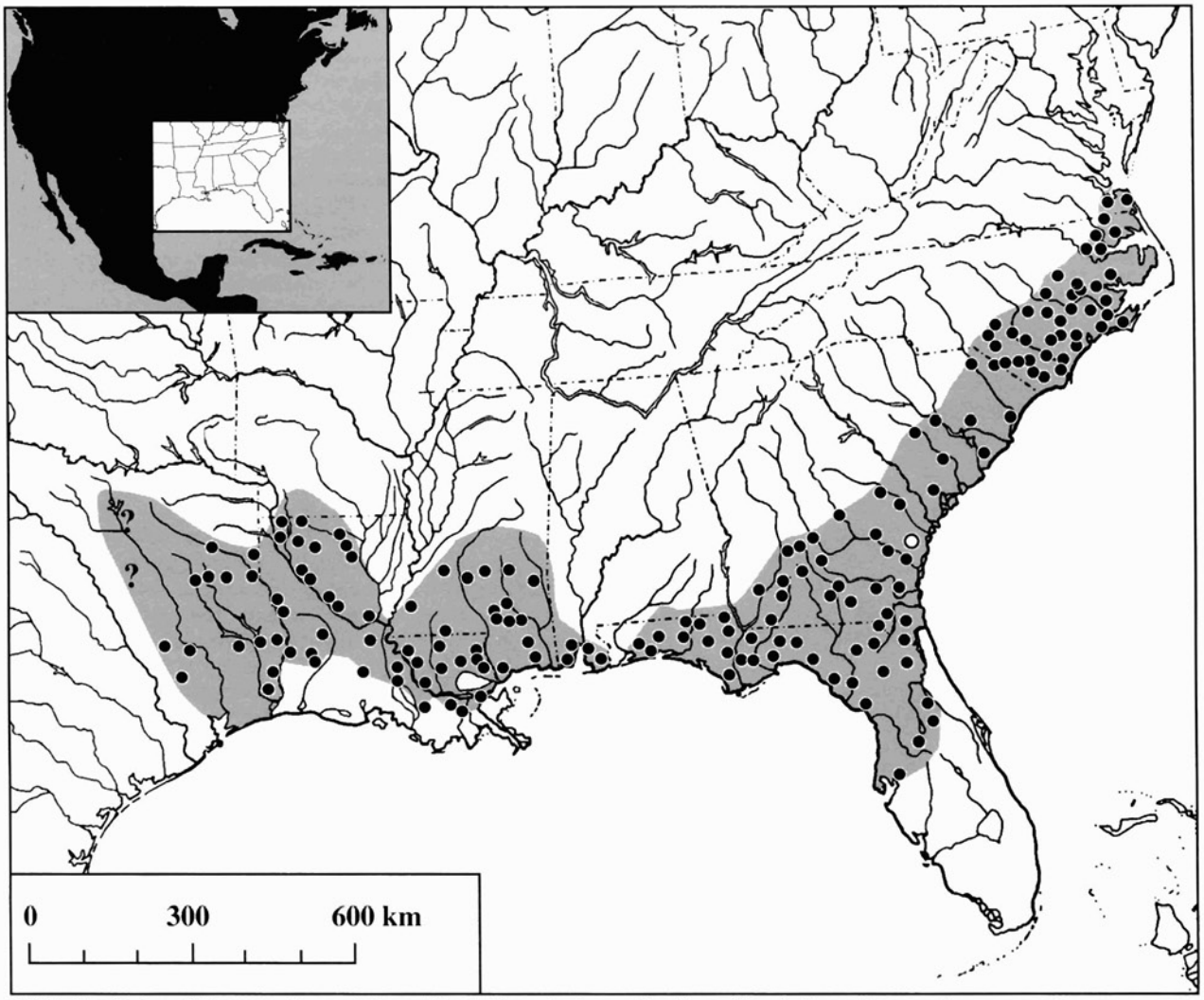
Desmognathus fuscus fuscus x *brimleyorum*: Wood and Clarke 1955:150. Misidentification and assignment as intergrades.

• **CONTENT.** No subspecies are recognized.

• **DEFINITION.** *Desmognathus auriculatus* is a wide-ranging, medium-sized plethodontid salamander with a distinct light patch, often red, running on the cheek from the posterior of the orbit to the posterior of the commissure. Breeding males from Mississippi were 40–65 mm, mature females 38–55 mm SVL (Valentine 1963); from Texas males averaged 46.6 mm SVL (N = 92, 31–55 mm) and females 45.0 mm (N = 112, 31–56 mm)(Cook and Brown 1974), and from Florida adult males with two or more lobes per testis averaged 52 mm SVL (N = 27, 44–66 mm) and females 47.0 mm (N = 19, 43–53 mm)(Means 1974). The largest specimens, two unsexed individuals, were reported by Funk (1964) from North Carolina at 75.6 and 83.5 mm SVL and 149.2 and 162.8 mm TL, respectively.

In Florida and the Atlantic Coastal Plain, *D. auriculatus* is jet black dorsally and ventrally. Three parallel lines of white dots run laterally down the trunk and on the sides of the tail. These are aggregations of white iridophores surrounding the circular vestiges of the larval neuromast organs (Means 1974). The uppermost line forms small, discrete, dorsolateral spots that neither coalesce dorsally along the axis of the body, as in many other desmognathines, nor on the top of the tail. This line is often obscured by melanization. A second, lower, line is usually obscured by melanization on the trunk, but runs out onto the sides of the tail to form discrete, white, diagnostic "portholes" that usually are visible throughout life. The third line runs between the axilla and the insertion of the hind leg, also forming diagnostic "portholes." In many populations, especially in Florida, individuals have a strong overwash of red pigment that is obscure over the intense black ground color, but is very obvious over the light cheek patch and on the white "portholes," which sometimes appear intensely red. The red color is lost quickly in preserved specimens. The belly is black or dark brown and usually peppered with small, white flecks. The flecks may be nearly absent, but when abundant, the belly may appear more white than black. A small, but distinct, dorsal fleshy keel is present on the tail, usually for its entire length. Western populations from Mississippi to Texas may appear as those described above or may have a browner tone to the dark ground color (Cook and Brown 1974). See also Comments.

FIGURE. Adult female *Desmognathus auriculatus* from the Apalachicola National Forest, Liberty Co., Florida (photograph by author).



MAP. Distribution of *Desmognathus auriculatus*. The circle marks the type locality and dots indicate other records.

The tail is laterally compressed and blade-shaped, especially posteriorly (Means 1974), and often has a faint wash of brown or reddish color over its dorsal base. The toe tips lack cornifications. Costal grooves between armpit and groin number 14 (Means 1999c).

The black or dusky brown larvae range from about 9–10 mm SVL at hatching to 24–32 mm at transformation (Valentine 1963, Dodd 1998, Means 1999c) and are unique among desmognathines for their darkly pigmented, bushy gills with 22–40 gill fimbriae per side (Valentine 1963).

• **DIAGNOSIS.** Valentine (1963) compared *Desmognathus auriculatus* with *D. fuscus conanti* from Mississippi. Means and Karlin (1989) discussed differences between *D. auriculatus* and two parapatric species in Florida, *D. apalachicolae* and *D. fuscus conanti*. *Desmognathus apalachicolae* is smaller as an adult and has a round tail when compared to the more robust and bladelike tail, with a distinct dorsal keel, of *D. auriculatus*. The tail of *D. fuscus conanti* is slightly keeled, but not so strongly as *D. auriculatus*. Dorsally, *D. auriculatus* usually is patternless but may be slightly lighter in color than laterally. In Texas, Louisiana, and Mississippi, the light middorsal area may appear as a slightly emarginate stripe. *Desmognathus auriculatus* does not have 10–14 roundish blotches that are set off vividly from the dorsal ground color and often are fused in pairs across the back, as in *D. apalachicolae* and *D. f. conanti*. The belly of *D. auriculatus* is black and often speckled with small patches of white iridophores. The bellies of *D. apalachicolae* and *D. f. conanti* are white with a wash of dark pigment. Laterally, *D. auriculatus* is uniformly black, usually with a sharply demarcated row of white spots (sometimes red) between the axilla and the insertion of the hind limb; in contrast, the lateral aspect of *D. apalachicolae* and *D. f. conanti* is bicolored, the dark dorsolateral pigment thinning out to a light-colored ventrolateral aspect. The commissure of *D. auriculatus* is nearly straight and the dentary is neither edentulous posteriorly nor notched as in *D. apalachicolae* and *D. ochrophaeus* (Means 1974, Means and Karlin 1989).

• **DESCRIPTIONS.** Detailed descriptions of the adults were given in Holbrook (1838), Cope (1869), Dunn (1917, 1926), Bishop (1943, color pattern and variation), Chaney (1949, Louisiana), Robertson and Tyson (1950), Goin (1951), Neill (1951), Carr and Goin (1959), Rossman (1959, Florida and Georgia), Valentine (1963, Mississippi), Folkerts (1968, Alabama variation), Cochran and Goin (1970), Livezey (1950, Texas), Cook and Brown (1974, Texas), Stevenson (1976), Martof et al. (1980), Means (1974, 1986, 1999c, Florida), and Conant and Collins (1991). Eggs found in the field were described by Chaney (1949), Livezey (1950), Goin (1951), Neill (1951), and Means

(1999c). Chaney (1949) and Goin (1951) described hatchlings. A number of researchers have described the larva: Chaney (1949), Neill (1951), Valentine (1963), Folkerts (1968), Rubenstein (1971), Cook and Brown (1974), and Means (1974, 1999c). Altig and Ireland (1984) provided a key to larval salamanders by which larvae of *D. auriculatus* can be identified. Recently metamorphosed individuals are described in Chaney (1949), Folkerts (1968), and Means (1999c). The size of hatchlings, larvae, and metamorphs was reported from Florida by Dodd (1998) and Means (1999c). Livezey (1950), Folkerts (1968), and Means (1974, 1999c) described juveniles. Melanization and color change were discussed by Grobman (1950) and Means (1974). Smith (1960) made color pattern and morphometric comparisons with desmognathines from Arkansas. Rossman (1959) and Means (1974) compared *D. auriculatus* from south Georgia and north Florida with *D. f. carri* Neill from Marion Co., Florida and *D. f. conanti*, and concluded that *carri* was a synomym of *D. auriculatus*. Means and Karlin (1989) described the differences between *D. auriculatus* and *D. apalachicolae*.

• **ILLUSTRATIONS.** Eggs and developing embryos from Louisiana are illustrated in Chaney (1949). A Florida hatchling is illustrated in Goin (1951). Pen and ink illustrations of larvae are in Valentine (1963, Mississippi), Cook and Brown (1974, Texas), and Ashton and Ashton (1988, Florida). Black and white photographs of Mississippi and Florida larvae and transformlings appear in Means (1974) and Petranka (1998). Accurate drawings of adults appear in Holbrook (1838), Neill (1951), Conant (1975), Conant and Collins (1998), and Powell et al. (1998). Black and white photographs of adults are found in Bishop (1943), Valentine (1963), Means (1974), and Mount (1975). Color photographs of adults are in Behler and King (1979), Martof et al. (1980), Means (1986), Ashton and Ashton (1988), and Bartlett and Bartlett (1999).

Camera lucida drawings of dry skulls are in Means (1974) and of cleared and stained larval skulls in Rubenstein (1971). A drawing of the external jaw profile was published by Means (1974) and compared with that of *D. apalachicolae* (=*D. fuscus* in the paper). Camera lucida drawings of premaxillary bones and six skulls displaying fontanelle morphology and x-rays of the tails of adults displaying the relation between bones and dorsal fleshy keel and regenerated tail tips are in Means (1974). Means (1974) published photographs depicting the development of the color pattern from larva to juvenile in Mississippi and Florida populations; also black and white photographs of ontogenetic series of color pattern development in juveniles and adults from Mississippi, Florida, Georgia, and a ravine-inhabiting deme in Okaloosa Co., Florida. Means (1974) also published a black and white photograph of a series of juveniles and adults of *D. auriculatus* next to a series of juveniles and adults of *D. apalachicolae*, all collected from the same locality.

• **DISTRIBUTION.** *Desmognathus auriculatus* ranges widely from southeastern Virginia to east Texas (Conant and Collins 1998, Petranka 1998). It is confined to the Coastal Plain, but rarely reaches inland to the Fall Line in the Atlantic Coastal Plain, and never in the Gulf Coastal Plain. Its distribution in Virginia and the Carolinas is poorly known and has never been formally studied (Wood and Clarke 1955, Martof et al. 1980), although several range notes exist for North Carolina (Myers 1924, Brimley and Mabee 1925, Chamberlain 1930, Eaton 1953) and South Carolina (Schmidt 1924, Bishop 1927, Pickens 1927, Hoy et al. 1953). In southern Georgia the range is incompletely known (Neill 1941, Laerm et al. 1980, Williamson and Moulis 1994, Lacy 1997). In Florida, *D. auriculatus* ranges widely in the northern part of the state but drops out halfway down the peninsula about Levy Co. (Lönnberg 1894; Brimley 1910; Fowler 1917; Carr 1940; Means 1974, 1975, 1999c; Seehorn 1982; Means and Simberloff 1987; Enge 1997a,b). In Alabama, the range is restricted to the southern tier of counties along the Florida border and adjacent to Mobile Bay in Escambia and Baldwin counties (Loding 1922, Holt 1924, Mount 1975); apparently the high elevations of the southern Alabama Red Hills do not provide the swampy wetland habitat of *D. auriculatus*. In Mississippi, the species ranges farther inland along the swampy rivers that drain into the Gulf (Cook 1957, Valentine 1963). The species was abundant in the Florida parishes of Louisiana, and west to the Texas border in the middle portion of that state (Burt 1935), but is unconfirmed from a 25–50-mile wide belt inland from the coast in southwestern Louisiana (Dundee and Rossman 1989). In Texas, the species ranges throughout the Sabine, Neches, and Trinity river basins (Burt 1938, Wright and Wright 1938, Smith and Buechner 1947, Sanders and Smith 1949, Burger et al. 1949, Brown 1950, Dial 1965, Cook and Brown 1974, Seifert and Wuerch 1978, Rakowitz et al. 1983, Dixon 1987). *Desmognathus auriculatus* is confined to swampy habitats of the outer Coastal Plain where the elevations run from "Sea level to between 100 and 500 feet" (Dunn 1917). Disjunct populations reported from Alabama and from above the Fall Line in Georgia (Petranka 1998) are probably based on misidentified specimens.

• **FOSSIL RECORD.** None.

• **PERTINENT LITERATURE.** Adler (1976) discussed the status of the **type specimens**. Anatomical studies have addressed **tail shape** (Cook and Brown 1974, Folkerts 1968, Means 1974), **dentition and tooth shape** (Means 1974, Cook and Brown 1974), **commisure and dentary profile** (Means 1974, Cook and Brown 1974), **cranial osteology** (Means 1974), **neuromast organs of the acousticolateralis system** (Means 1974), **hyobranchial apparatus** (Cook and Brown 1974), **gill morphology** (Valentine 1963, Cook and Brown 1974), **cloacal anatomy** (Sever 1983, Sever and Trauth 1990), **maximum size** (Funk 1964), and **lunglessness** (Lönnberg 1896). **Larval morphology** was described by Means (1974), Cook and Brown (1974), and **allometric growth** in larvae was studied by Rubenstein (1971). Piatt (1935) described the **hyobranchial apparatus** and **throat musculature**, and Wake (1966) consulted one dry skeleton and six cleared and stained specimens in his monograph on plethodontid evolution and comparative osteology. Knepton (1950) described the **corium**, **epidermis**, and **dermis** of histological sections, concluding that the black and light brown color of individuals is dependent on the number of melanin granules present in the dermal melanophores.

Chaney (1949) did a comprehensive study of the **life history** of populations in the Florida parishes of Louisiana including growth rates of all life stages, ovarian egg diameter and weight to female body size with time, ovarian egg counts, eggs in the field, nests, enemies, parasites, and food. Brooding females were reported by Chaney (1949), Robertson and Tyson (1950), Eaton (1953), and Mount (1975). Season of oviposition was estimated by Dodd (1998) and Means (1999c). Season of hatching was reported by Means (1999c). Length and season of incubation period are estimated in Chaney (1949), Folkerts (1968), Mount (1975), and Means (1999c). Larval life and habits were described by Folkerts (1968), Livezey (1950), Dodd (1998), and Means (1999c). Trauth et al. (1990) reported larval size, ovarian clutch sizes, ovum diameters, and seasonal occurrence of larvae and gravid females from Arkansas. Chaney (1949), Eaton (1953), and Means (1999c) provided data on the season of transformation. Seasonal availability of adults was mentioned in Corrington (1927), Allen (1932), Livezey (1950), and Means

(1999b, c). Behavior during drought was reported by Means (1999c). Age at maturity in both sexes was calculated by Means (1999c). Abundance in nature is mentioned in Folkerts (1968) and Means (1999b). Overwintering behavior is described by Neill (1948). Longevity was reported by Snider and Bowler (1992). Several authors mention nests and egg clutches found in the field: Van Hyning (1933), Neill and Rose (1949), Robertson and Tyson (1950), Goin (1951), Rose (1966), Mount (1975), and Means (1999c). Nests where egg clutches reposed are described by Goin (1951), Robertson and Tyson (1950), Wood and Clarke (1955) and Means (1999c). Homing to nests was studied by Rose (1966).

Habitat is mentioned or discussed in Corrington (1927), Allen (1932), Van Hyning (1933), Harper (1935), Carr (1940), Livezey (1950), Robertson and Tyson (1950), Neill (1951), Schwartz and Etheridge (1954), Rossman (1959), Carr and Goin (1959), Cooper (1962), Folkerts (1968), Means (1974, 1975, 1986, 1999a,b,c), Mount (1975), Enge (1997b), and Dodd (1998). **Nocturnal habits** are mentioned by Carr (1940) and **vertebrate ecological associates** by Chamberlain (1930), Cooper (1962), Dial (1965), Bruce (1971), Schwartz and Etheridge (1954), Anderson and Williamson (1976), Semlitsch (1983), Semlitsch and West (1983), Means (1974, 1999a,b,c), Enge (1997a,b), and Dodd (1998). Mushinsky (1975) reported field **substrate pH** and the results of experimental substrate-pH selection tests.

Food items observed in the gut were discussed by Carr (1940) and Folkerts (1968). Only *Nerodia fasciata* (Brown 1979) and *Esox americanus* (Harper 1935) have been reported as **predators**, but Means (1999b) implicated feral pigs. **Oophagy and cannibalism** were reported by Chaney (1949), Rose (1966), Wood and Clarke (1955). **Chigger mites** were found on *D. fuscus* (=*auriculatus*) from Texas (Loomis 1956).

An **amino acid paper chromatography** study was done by Dean (1959). Protein variation using **starch-gel electrophoresis** was studied by Hinderstein (1971), Karlin (1978), Karlin and Guttman (1986), and Blouin (1986). Karlin and Guttman (1986) estimated genetic divergence times from congeners. Titus and Larson (1996) hypothesized **phylogenetic relationships** of *D. auriculatus* in Desmognathinae using mitochondrial DNA sequences encoding 12S and 16S ribosomal RNA, morphological, and reproductive characters.

Means (1975) hypothesized that the parapatric distribution of *D. auriculatus* with *D. apalachicolae* and *D. fuscus conanti* in the Florida panhandle resulted from competition and agonistic behavior between adult males. Neill (1952) reported on a single **vocalization** heard in the field. **Courtship behavior** was studied experimentally in the laboratory by Noble and Brady (1930), who attempted to hybridize *D. auriculatus* with congeners, and by Verrell (1997). Means (1975) reported **competitive exclusion** of *D. auriculatus* by *D. fuscus conanti* and *D. apalachicolae* in Florida. **Biogeography** is discussed by Blair (1950), Neill (1957), Wake (1966), Lohoefener and Altig (1983), and Means and Simberloff (1987). The monetary value is given by SSAR Monetary Value of Amphibians Subcommittee (1989). The poorly known status of Alabama populations was proposed by Means (1986). *Desmognathus auriculatus*, as an imperiled and declining species, was reported by Dodd (1997, 1998) and Means (1999b).

• **ETYMOLOGY.** The specific epithet is from the Latin, *auriculatus* (= eared), in reference to a "reddish-brown spot near the ear" or "an oblong reddish-brown spot behind the ear," which is the typical desmognathine stripe projecting backward and downward from the posterior of the eye to the corner of the mouth. The species is rarely seen by locals, and no vernacular names are known. The common name, Southern Dusky Salamander, was first applied by Corrington (1927).

• **COMMENT.** In the eastern portions of its range *D. auriculatus* is largely allopatric or parapatric with congeners and is reasonably uniform morphologically. From Mississippi westward, however, populations of *auriculatus*-like animals often are lighter colored overall, and researchers have had difficulty assigning them to *D. auriculatus, D. brimleyorum, or D. fuscus conanti*. Reviewing *D. fusca*, Cope (1869) stated that "There are two color varieties which blend together so as to indicate that no higher value can be attached to them." This set the stage for nearly an entire century when *D. auriculatus* was considered a subspecies of *D. fuscus*. Dunn (1926) further clouded the systematic status of western *Desmognathus* by suppressing *D. brimleyorum* as a race of *D. fuscus*, and by making the following statement about *D. f. auriculatus*: "Specimens from the western part of the range are lighter in general coloration, thus approaching *brimleyorum*." For the ensuing 40 years, most students of *Desmognathus* grappled with the notion that three races of *D. fuscus* probably explained the color pattern variation in the Coastal Plain from Virginia to east Texas and Arkansas (Carr 1940; Grobman 1950; Chaney 1949, 1958; Carr and Goin 1959; Folkerts 1968).

Subsequent research by several workers established that *D. brimleyorum* is a distinct species confined to the Ouachita Mountains of Arkansas and Oklahoma (Valentine 1963, Folkerts 1968, Means 1974), but variation among swamp- and ravine-inhabiting populations of the western Gulf Coastal Plain was not resolved. In Mississippi, Valentine (1963) recognized and described two distinct species, *D. auriculatus* and *D. fuscus conanti*. Cook and Brown (1974) concluded that Texas populations "appear to be closely related to if not conspecific with *D. auriculatus* from Florida, southeastern Louisiana, and Mississippi."

Across the Florida panhandle and southern Alabama, Folkerts (1968) maintained that *auriculatus* was an ecological race of *D. fuscus*, but Means (1974, 1975) argued that they were two distinct species in Florida. Rossman (1959) created the subspecies *D. f. conanti* for populations from southern Illinois, western Kentucky, and western Tennessee, with an indication that *conanti* ranged through eastern Mississippi and Alabama into western Florida. Karlin and Guttman (1986) and Means and Karlin (1989) recognized four species in western Florida, *D. auriculatus*, *D. f. conanti*, *D. apalachicolae*, and *D. monticola*.

Populations from Louisiana have remained an enigma. In a comprehensive study of the life history of six populations in Louisana, Chaney (1949) believed that he was working with *D. f. auriculatus*, but he mentioned that some light-colored populations had the color pattern of *D. f. fuscus* and *D. f. brimleyorum*. Eight years later, Chaney (1958) concluded that *D. f. brimleyorum* was not in Louisiana, but he did not recognize *D. auriculatus*. Dundee and Rossman (1989) concluded that two morphological types exist in Louisiana, a ravine-dwelling "*fuscus*" type and a swamp-dwelling "*auriculatus*" type, but intermediates occur as well. They were uncertain about the systematic status of *Desmognathus* in Louisiana, and whether *fuscus* and *auriculatus* are species that hybridize or subspecies that intergrade. The systematic status of *Desmognathus* in the southwestern corner of the range of the genus remains unresolved.

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